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Kate Glenn

Date: July 2, 1999

Assistant Commissioner for Patents
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Sir:

Transmitted herewith for filing is the patent application of:

Inventor: Saeed GANJI

For: PRINTER DESCRIPTION FILE FORMAT GENERATOR

Docket No.: EFIM0051

Enclosed are:

- (X) 2 sheets of drawings
- (X) A copy of a patent application
- (X) A declaration and power of attorney
- (X) An assignment of the invention to: **Electronics for Imaging, Inc.**
- (X) An Information Disclosure Statement, 1449 Form and cited references
- (X) One self addressed postcard

The filing fee has been calculated as shown below:

| Fee Calculation (large entity) | | | | | |
|--|--------------|-------------------------|--------------|-----------|-------------|
| Fee Items | Claims Filed | Included with Basic Fee | Extra Claims | Fee Rate | Total |
| Total Claims | 10 | 20 | 0 | \$ 18.00 | \$ - |
| Independent Claims | 6 | 3 | 3 | \$ 78.00 | \$ 234.00 |
| Multiple Dependent Claim Fee (for one or more) | | | | \$ 260.00 | |
| Assignment Recordation Fee | | | | \$ 40.00 | \$40.00 |
| Basic Filing Fee | | | | \$ 760.00 | \$ 760.00 |
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A copy of this sheet is enclosed for accounting purposes.

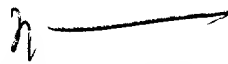
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Printer Description File Format Generator

BACKGROUND OF THE INVENTION

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TECHNICAL FIELD

The invention relates to PostScript® Printer Description (PPD) files and more particularly to computer processes and systems for generating PPD files for printers.

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DESCRIPTION OF THE PRIOR ART

A PostScript® Printer Description (PPD) file is a text file that describes the printer features unique to particular printers in particular environments to the PostScript® Printer Driver(s) available for that environment. Ubiquitous PostScript® printer driver executable program files are used to provide communications between an application program and PostScript®-enabled printers residing on the network. Each PPD file contains certain phrases that describe what a particular printer is capable of doing. PPD files are commonly created by manufacturers of PostScript® printers. The driver is created either by Adobe Systems, Inc., the creators of PostScript® language, or by provider of the particular operating system the user is using (whether it be Microsoft corporation in case of Windows or Apple Computers in case of Macintosh), or it is sometimes provided by manufacturers of different application programs that a user may be using.

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A PPD file is not a printer driver. It is an information file, in ASCII format, that is used by a printer driver loaded by an operating system or application program. Because PPDs are all written in ASCII-text format, they are not limited to a specific software environment or platform. An ASCII-text PPD file can therefore be used equally well in Windows, MAC-OS, and UNIX environments, and by a variety of software applications. Adobe Systems, Inc. (Sunnyvale, CA) has defined how PPD files must be constructed by printer and software vendors in the "PPD Specification," now at version 4.3.

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In general, a PPD file contains information that describe the capabilities of a particular printer to a printer driver. The driver then communicates some of this information to the end-user and allows him to choose certain features suited to the file being printed. For example, if the printer in question is color capable, has duplexing (ability to print to both

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sides of the page) , and supports paper sizes Letter, Legal, and Tabloid, then printer drivers having access to this PPD are capable of providing this information to user using common user interface features such as popup menus and radio buttons. The user then selects a combination of the features available on that particular printer to be used when the data is at some point being printed. For example, a user may choose to print a certain word processing document to a letter-size page in black and white mode while the same or another user may decide to print another file containing graphics to a tabloid-size page in color.

10 It is an unfortunate fact for the manufacturer of PPDs that all PostScript printer drivers that claim to conform to the Adobe PPD Specifications often do not behave in exact manners when using a PPD. There are several gray area situations in which a PPD file that works correctly for one printer driver, may fail in part when used by another driver. As a result, a manufacturer of PPDs has to provide several PPD files that are each suited for a particular environment so that a majority of potential users can take advantage of their benefits. One such situation arises with PPD files for languages other than English. Since PPD files contain strings used in user-interface dialogs, these strings need to be translated for all supported languages. The way different drivers interpret non-English characters, such as "graves", "acutes" and "umlates", are different on different platforms. So a French PPD for the Macintosh platform is different than a PPD for Windows 3.1 at least when it comes to these strings. These PPDs may also be different due to technical reasons determined by the printer/PPD manufacturer. For example, the manufacturer may decide that a certain feature is to be supported only on Windows 95/98 platforms but not on Windows NT.

25 The conventional method of generating PPD files for different platforms and languages involves a significant amount of manual typing or "copy and paste" operations. This is an overwhelming task. Let us assume that at some point during the development of a printer, an engineer working for the printer manufacturing company is assigned the task of adding support for a new pagesize, A4, to all the PPDs pertaining to that product. The challenge is two-fold. First of all, he must come up with the ASCII text segments that must be added or changed in the existing PPD. Secondly, he must make these changes to every PPD the company is shipping for that printer. If the product line supports three languages and four platforms, he is faced with the daunting task of editing twelve (3 languages x 4 platforms) files. The conventional method, therefore, can be described as time-consuming and prone to human errors as each revision for a language-platform combination is constructed.

It would be advantageous to provide a system that generates all the necessary PPD files for all platforms and languages from a single source.

SUMMARY OF THE INVENTION

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The invention provides a PPD generator that generates all the necessary PPD files for all supported platforms and languages for the print engines in a particular manufacturer's product line from one or more base PPDs. The PPD generator uses an associated build file that contains information as to how the base PPDs are to be edited for all the supported languages, as well as exceptions to standard features attendant with a particular target platform/language.

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The PPD generator includes the following components: First, there is an initial setup section where several flags, or variables, are set to initial values that are used during the PPD generation process. Secondly, there is a routine set of procedures that are performed on almost all PPDs with small variations based on the initial flag values. Thirdly, there is a component that uses information contained in the build file to change further and shape some of the generated PPDs based on unique criteria that are specific to that particular product line's PPDs.

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The invention enables maximum flexibility because an engineer can provide specific information regarding the needed changes for each platform, and it is only necessary, in most situations, to work on the single base PPD for each new revision after the build file is first created. Thus, the invention saves a significant amount of time that would otherwise be used to perform cut-and-paste operations, it minimizes the potential for human errors, it takes very little time to setup in most cases, and it provides an expansive method of customizing any number of PPDs based on the specific needs of a particular project.

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Table I illustrates how the number of PPD files that need to be supplied for each printer or application program can proliferate. A different PPD file is needed in each user application environment.

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TABLE I. Typical PPD File Constellation

| | Mac | PC | UNIX |
|----------|--------------|-------------|---------------|
| English | English-Mac | English-PC | English-UNIX |
| French | French-Mac | French-PC | French-UNIX |
| German | German-Mac | German-PC | German-UNIX |
| Japanese | Japanese-Mac | Japanese-PC | Japanese-UNIX |

5 The reason that natural languages must be involved is that a printer driver must ask a user what printer features are to be selected. To do this, various spaces in conventional windows-type dialog boxes are presented on the computer screen. These spaces must be painted with an appropriate phrase scripted in the user's language. For example, it is very common for a printer driver literally to ask a user if letter, legal, A4, or
 10 tabloid paper sizes are to be used in a print job. The user's selection is made by pressing a radio button in the dialog box, and this choice is used to setup the preferences for the printer.

The words or phrases, letter, legal, A4, or tabloid are supplied by the base PPD 201.

15 The fact that such paper sizes can each be selected at all is also supplied by the base PPD. The computer platform for the operating system matters because some platforms cannot support particular features of the printer that other platforms can. Because the base PPD is a text file, and not executable code, the platform differences appear only as PostScript® and text string differences.

20 Each base PPD comprises a text file of instructions and user strings that can be translated. One object of the invention is to provide a PPD generator to translate such portions.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram that shows the interaction between the PPD, the PostScript printer driver, the printer, and the user; and

30 Fig. 2 is a functional block diagram that shows how the base PPD and the build file interact with the PPD generator to create all the PPD files necessary to the project.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a block diagram that shows the interaction between a PPD, a PostScript printer driver, a printer, and an end user. In such system 100, the end user 20 operates a computer that is running a particular application program 18, such as Microsoft Word or Adobe PhotoShop. When the user wants to print from the program, a print file is sent to the PostScript printer driver 12. The PostScript printer driver accesses a PPD file 10 which describes the capabilities of a particular printer 14 to the printer driver. The driver then communicates some of this information to the end-user and, as a result of a user dialog 14, allows him to choose certain features suited to the file being printed. The user then selects a combination of the features available on that particular printer to be used when the data are at some point being printed.

Fig. 2 is a functional block diagram that shows how a base PPD and a build file interact with a PPD generator in the system 200 to create all the PPD files necessary for a project. For purposes of the discussion herein, a project is a PPD file for a specific language/platform combination, e.g. French and Unix. In the preferred embodiment of the invention, one or more base PPDs 201 are provided, where a base PPD is provided for each print engine in a particular manufacturer's product platform. For example, for the Xerox ZX Fiery product, a separate base PPD is provided for the 5750 and 5760 copier models. For purposes of the discussion herein, a base PPD is best thought of as a quasi-PPD file that is used as a template during the PPD generation process.

The base PPD essentially mimics the PPD for one particular language and platform combination, for example, English-Macintosh. Thus, the original design is expressed only once in the base PPDs using the English-Macintosh version. This one parent or source is used by the PPD generator 202 in the automatic generation of all the other PPDs, e.g. for all other language/platform combinations 203-1 to 203-n and 207-1 to 207-n. Thus, the conventional method of manually constructing each combinational PPD file is entirely avoided.

In the preferred embodiment of the invention, each base PPD is a text file that includes PostScript® phrases and corresponding dialog window text strings that are related to particular features and user choices for a printer. The exact construction of a PPD file is described by Adobe Systems, Inc. (Sunnyvale, CA) in their widely circulated publication titled, *PPD Specification*, now at version 4.3.

The base PPD provides the generic framework needed to generate all PPD file varieties for a particular printer. Such PPD frameworks have components that must be tailored for the kind of platforms used and the natural language that users must see in 5 page setup and printer setup dialog boxes. For example, the kinds of platforms can include WINDOWS, MacOS, UNIX, and OS/2. The kinds of languages can include, for example, English, French, German, and Japanese. Each such combination of platform and language is represented collectively by a project PPD file 203-1 to 203-n and 207-1 to 207-n. The PPD generator 202 is a generation engine that contains a routine set of 10 operations that are found in all PPDs for all language and platform combinations.

The invention also includes a build file 205 which (in the presently preferred embodiment of the invention) includes a single line for each base PPD that tells the PPD generator which languages must be created for converting that particular base PPD into 15 all the varieties represented by the target PPD files 203-1 to 203-n and 207-1 to 207-n. The build file is used primarily to take care of platform specific issues. For example, if for some reason it is desired that the Windows 95 translation be different than all of the rest, a section is added to the build file that expresses that difference. The actual information that is necessary for a language translation, e.g. where an English word in a 20 print dialog should be replaced by a French, is part of the PPD generator. For example, the build file may specify that the Xerox 5750 PPDs are to include French, while the Xerox 5760 PPDs are to include Italian. The actual translation files are not unique to a particular product line and are executed as part of the PPD generator.

25 Furthermore, if two different printer manufacturers want different translation strings to be used for the same English word, for example, where the English string "Plain paper" is translated for one OEM as "Papier normal" and for another as "Papier ordinaire," one of the settings in the initial setup may be a variable named, e.g. OEMVersion. Based on that setting, a translation file in the PPD generator behaves differently for each printer 30 manufacturer by using if statements. Thus, in this embodiment of the invention the initial settings are:

Set OEMVersion "Xerox."

35 When the actual translation scripts are running, and it is time for the English_to_French script, the translation scripts have a line, such as:

```
if {OEMVersion} == "Xerox"
    translate "Plain paper" this way
elseif {OEMVersion} == "Canon"
5    translate "Plain paper" this other way
else
    translate "Plain paper" that way
end
```

10 Design changes and bug fixes are accommodated by changing the base PPD files and then running the PPD generator so that it generates a new group of PPD files for all platform/language combinations. The build file is used to identify a particular product's peculiarities to the PPD generator and to instruct the PPD generator with regard to these peculiarities. Thus, the PPD generator applies a default set of translations to the base
15 PPDs, while the build file identifies both normal operations, such as language translations, and specific exceptions to the default that must be taken into account for the project PPD. The PPD generator produces the project PPD as a result of its interaction with both the base PPDs and the build file.

20 Note: In the preferred embodiment of the invention, there is only one build file for each project (*i.e.* Xerox ZX). Each base PPD has its own section in that project's build file. However, each PPD may alternatively have an associated build file in other embodiments of the invention.

25 A base PPD file may be used for a virtually unlimited number of projects, where such projects can exist simultaneously for mass-marketed products, such as printers. Typically, only one set of base PPDs exists at the original equipment manufacturer's location. Key to the invention is the fact that a base PPD may be specified for any number of target projects and that a build file may be provided for project specific
30 exceptions to a default conversion. Thus, the system assumes certain generic functions are to be provided for all PPDs that are generated, but these functions are easily reverted or changed, based upon specific project requirements. Further, system revisions are readily propagated throughout a product line to each language/platform combination by the simple expedient of changing the base PPDs and build file as
35 appropriate. This avoids the need to rebuild each PPD manually for each project and language/platform combination.

Table II represents an English-language type PPD file. Table III represents a corresponding French-language type PPD file for the same printer.

TABLE II. English-Language PPD

```

*OpenUI *EFCompression/Compression :PickOne
*OrderDependency: 05.0 AnySetup *EFCompression
*DefaultEFCompression: SCDefault
*EFCompression SCDefault/Printer's Default: ""
*EFCompression False/Off: " userdict /XJXsetRenderType known
    { (ADOBE) XJXsetRenderType }
    if "
*End
*EFCompression True/On: " userdict /XJXsetRenderType known
    { (AREND) XJXsetRenderType }
    if "
*End
*CloseUI: *EFCompression

```

TABLE III. French-Language PPD

```

*OpenUI *EFCompression/Compression :PickOne
*OrderDependency: 05.0 AnySetup*EFCompression
*DefaultEFCompression: SCDefault
*EFCompression SCDefault/Imprimante par défaut: ""
*EFCompression False/Non: " userdict /XJXsetRenderType known
    { (ADOBE) XJXsetRenderType }
    if ""
*End
*EFCompression True/Oui: " userdict /XJXsetRenderType known
    { (AREND) XJXsetRenderType }
    if "
*End
*CloseUI: *EFCompression

```

All the text strings in between a slash and colon pair are translated using automated scripts in the PPD generator. For example, in Table II, line 3, "Printer's Default" in English is replaced in Table III, line 3, by the French "Imprimante par défaut". Also, in Table II, line 7, "On" in English is replaced in Table III, line 7, by the French "Oui". These text strings are output to the user in a dialog by printer driver 12 (Fig. 1). The base PPD

has only one of the necessary strings, all the others are translated by lookup files in the build file 205. Each time there is to be a design change, *e.g.* to add a new printer feature or modify an existing one, all the PPD files 203-1 to 203-n and 207-1 to 207-n for all the different languages and platforms are automatically generated by the PPD generator using the base PPDs and the build file. This is much faster in the manufacturing environment than trying to do a manual copy-and-paste operation one-at-a-time on each of PPD files.

The build file for each project describes the build required for a particular printer to a main script in the PPD generator, *e.g.* a Canon versus a Xerox. The PPD generator opens the build file and searches for particular strings in the build file. If it finds them, then it knows something has to be done. Otherwise, it assumes nothing special needs to take place for that particular project. For example, Table IV is a portion of a build file.

TABLE IV

```

== new Mac only modifications
find •
replace /*OpenUI *InputSlotRest*/:/*CloseUI: *InputSlotRest"/    ""
find •
  replace /*OpenUI *InputSlotFirst*/:/*CloseUI: *InputSlotFirst"/    ""
== end modifications

```

The PPD generator searches the build file for "== new Mac only modifications". If found, it executes everything between that and "== end modifications".

In the above example, there are two "find the top of file" commands and two replace commands. One command replaces everything between "/*OpenUI *InputSlotRest" and "/*CloseUI: *InputSlotRest" with a blank (deleting them), and the next replace command similarly provides a delete function.

The input to the system is a base PPD file. This is usually the Macintosh-English PPD, or a file that closely resembles the Mac/English PPD. The purpose is to translate the base PPD to different languages and also different platforms as needed by the project. Along with the needed base PPD(s), there is also the build file that contains information, parsable by the PPD generator, as to how the required project PPD(s) is different from a standard PPD generated solely based on default methods built into the generator. For example, assume we have a Xerox and then a Canon PPD. The build file in each case

instructs the scripting system how to go about doing each particular product's PPDs. The Xerox PPD may ship only for English and French languages, but the Canon may include also Italian and Japanese, and may also have other differences.

- 5 Pseudo-code is used in Table V to state the operation in a way that resembles high level programming language.

TABLE V

```

for each PPD in the "original PPD's" folder
    find the section in the build file corresponding to this PPD
    for each language from the build file for this PPD
        # start with Mac PPD
            duplicate the PPD to "Macintosh:{language}:" folder
            perform the English->{language} translations
        # time to do windows PPD's, starting with Win31
            duplicate the Mac PPD to "{Language}:Win31:" folder
        perform Mac->win31 operations
        # now Windows 95/98
            Duplicate the Win31 PPD to win95 folder
            perform Win31->win95 operations
        # repeat with win_nt_4.0 and win_nt_3.5 and if
        # needed (from the build file), also the OS/2 PPD's
            # here we look perform platform specific changes
            for each platform
                search build file for platform specific changes
                if found, perform these operations on needed PPDs
            end for each platform
        end of for each language
    end of for each PPD
end of for each PPD
    
```

Although the present invention is described herein with reference to the preferred embodiment, one skilled in the art will readily appreciate that other applications may be substituted for those set forth herein without departing from the spirit and scope of the present invention. Accordingly, the present invention should only be limited by the Claims included below.

CLAIMS

- ✓ 1. A development environment for producing a platform-language constellation of printer description files, comprising:
- 5 at least one base printer description (PPD) text file for a single language and a single platform combination for a particular printer; and
- a PPD generator connected to import said at least one base PPD and to generate therefrom a plurality of PPD files for a variety of languages and platforms.
- 10 2. The development environment of Claim 1, further comprising:
- at least one build file that describes a product or platform specific set of features of said base PPD.
- ✓ 3. A method for generating an original set of printer description (PPD) text files, the
- 15 method comprising the steps of:
- providing at least one base PPD text file for a single language and a single platform combination for a particular printer;
- providing at least one build file that describes a product or platform specific set of features of said base PPD; and
- 20 generating at least one set of PPD files from said base PPD and said build file.
- ✓ 4. A method for revising an original set of printer description (PPD) text files, the method comprising the steps of:
- beginning with at least one base PPD and at least one build file that are
- 25 responsible for generating at least one PPD file for at least one specific target environment;
- modifying said at least one base PPD and/or said at least one build file into corresponding revised PPD and/or build files; and
- generating a revised set of PPD files from said revised base PPD and/or build file.
- 30
- ✓ 5. A method for manufacturing printer description (PPD) text files, the method comprising the steps of:
- providing at least one base PPD;
- providing at least one build file;
- 35 generating at least one set of PPD files from said base PPD and said build file.
6. The method of claim 5, further comprising the steps of:

beginning with a base PPD and a build file that is responsible for generating a set of printer description (PPD) text files;

modifying said base PPD and/or said build file into a revised base PPD and/or a revised build file; and

5 generating a revised set of PPD files from said base PPD and said build file.

✓7. A development environment for producing a platform-language constellation of printer description files, comprising:

at least one base printer description (PPD) text file for a single language and a
10 single platform combination for a particular printer; and

a PPD generator connected to import said at least one base PPD file and to generate therefrom a plurality of PPD files for a variety of languages and platforms.

8. The development environment of Claim 7, further comprising:
15 at least one build file.

9. The development environment of Claim 8, wherein:
said PPD generator parses said at least one base PPD and said at least one
20 build file into text based instructions that are parsed and assembled by PostScript® printer drivers.

✓10. A method for generating an original set of printer description (PPD) text files, the method comprising the steps of:
providing at least one base PPD;
25 providing at least one build file of text that describes a set of special features associated with a particular printer when used in one particular platform environment;
generating at least one PPD text file based upon information provided by said base PPD and said build file.

ABSTRACT

The conventional generation of original and design-change PPD files for printer drivers is tedious and prone to error as each version for a language-platform combination is constructed. The invention generates all the necessary PPD files for any needed platform/language combination from one or more base PPDs and one or more build files. A PPD generator draws on the information contained in the base PPD and build files to construct all the combinational varieties needed to support different languages and platforms, while providing an efficient and flexible environment for doing so.

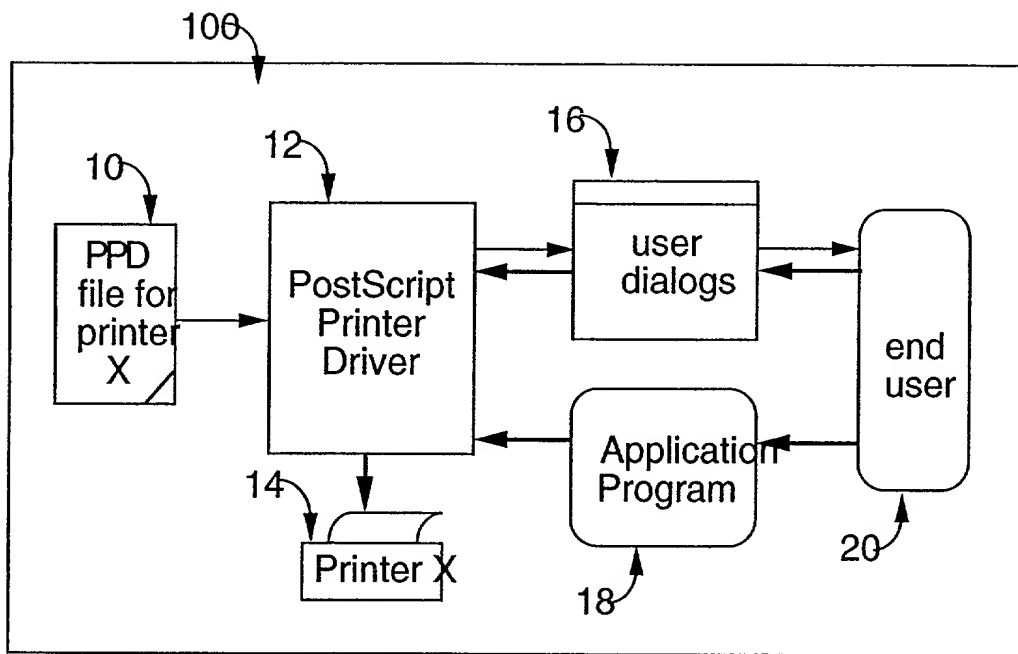


Figure 1: Original application environment

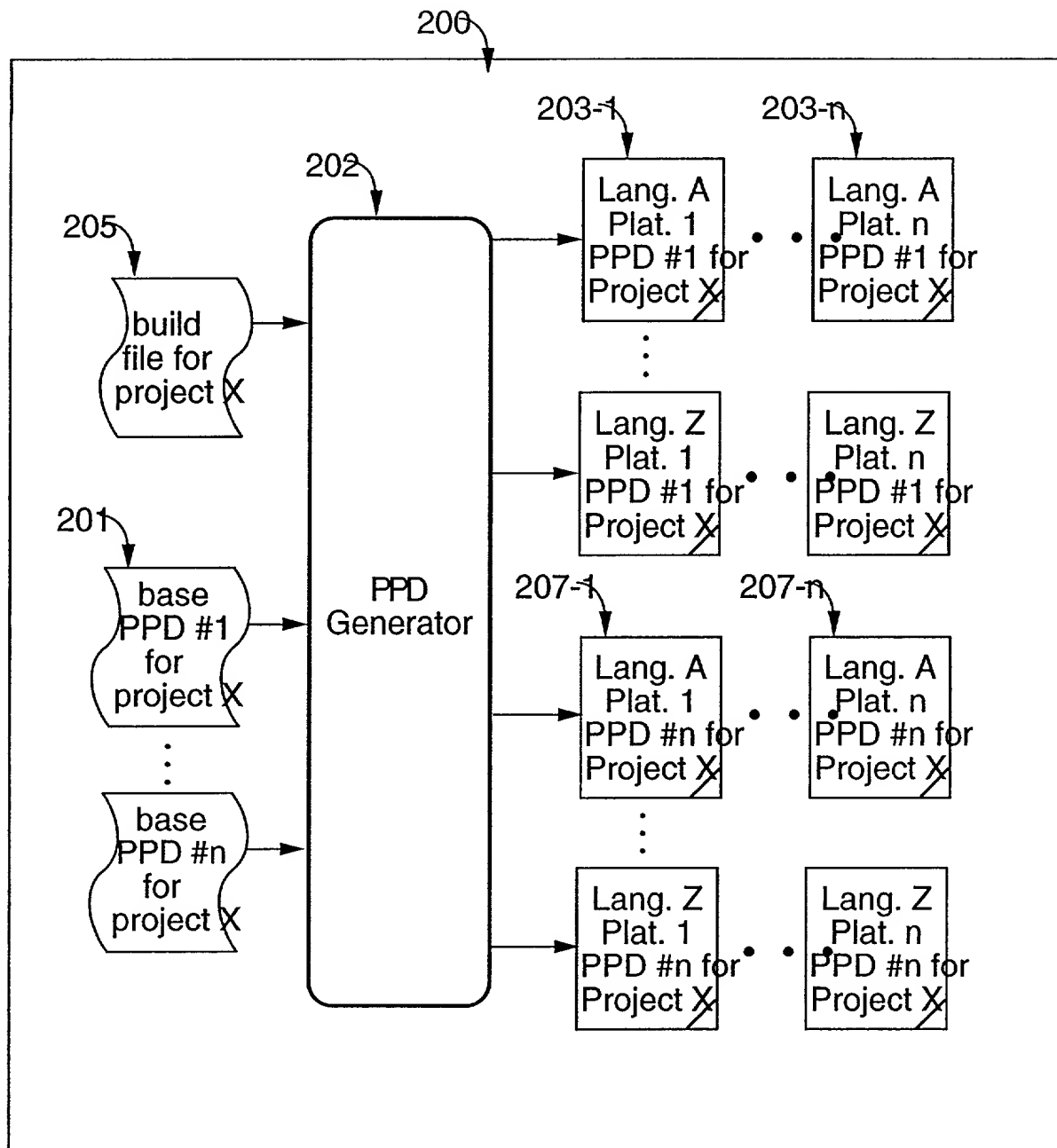


Figure 2: Functional overview of the invention

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

DITHERED IMAGE COMPRESSION SYSTEM

the specification of which (check one) ☒ is attached hereto, or _____ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

=====

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

| Prior Foreign Application(s) | | | Priority Claimed | |
|------------------------------|---------|----------------------|------------------|-------|
| | | | Yes | No |
| _____ | _____ | _____ | _____ | _____ |
| Number | Country | Day/Month/Year Filed | | |
| _____ | _____ | _____ | _____ | _____ |
| Number | Country | Day/Month/Year Filed | | |

=====

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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